

Course Overview for PoCS

Last updated: 2020/09/26, 14:13:25 EDT

Principles of Complex Systems, Vol. 1 | @pocsvox
CSYS/MATH 300, Fall, 2020

Prof. Peter Sheridan Dodds | @peterdodds

Computational Story Lab | Vermont Complex Systems Center
Vermont Advanced Computing Core | University of Vermont



PoCS, Vol. 1
What's the John
Dory?
1 of 59

Orientation

Course Information
Centers, Books, Resources

Topics
Narrative Arc

Tarot Cards
Projects

References



Licensed under the *Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License*.

These slides are brought to you by:

Sealie & Lambie
Productions

PoCS, Vol. 1
What's the John
Dory?
2 of 59

Orientation

Course Information
Centers, Books, Resources

Topics
Narrative Arc

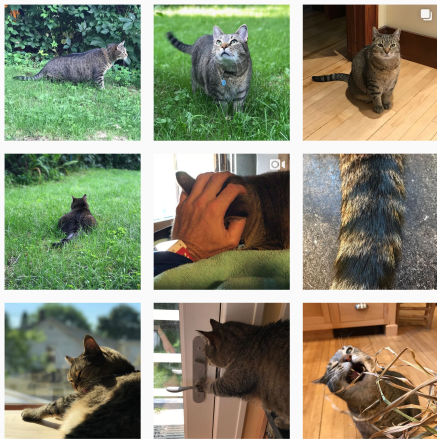
Tarot Cards
Projects

References



These slides are also brought to you by:

Special Guest Executive Producer



PoCS, Vol. 1
What's the John
Dory?
3 of 59

Orientation

Course Information

Centers, Books, Resources

Topics



Narrative Arc

Tarot Cards

Projects

References



 On Instagram at [pratchett_the_cat](https://www.instagram.com/pratchett_the_cat) 

Outline

PoCS, Vol. 1
What's the John
Dory?
4 of 59

Orientation

- Course Information
- Centers, Books, Resources
- Topics
- Narrative Arc
- Tarot Cards
- Projects

Orientation

- Course Information
- Centers, Books, Resources
- Topics
- Narrative Arc
- Tarot Cards
- Projects

References

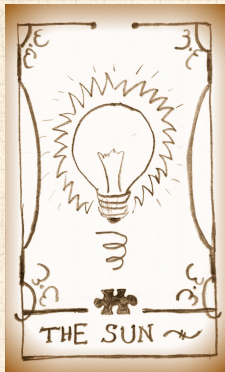
References



Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

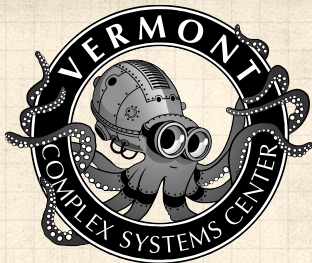
References



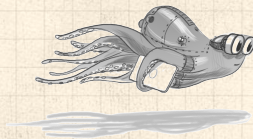
Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References




Describe | Explain | Create | Share | Ethos: Play



vermontcomplexsystems.org 

Vermont Complex Systems Center (2006–):



 Diverse research and teaching portfolio (> 400 papers in 2010–2015).

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):




-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):

-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Orientation



Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):

-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#) , [ALife 2020](#) .

Vermont Complex Systems Center (2006–):










-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#) , [ALife 2020](#) .
-  Fully developed educational platform in Complex Systems and Data Science.

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):











-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#), [ALife 2020](#).
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#)

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):












-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#) , [ALife 2020](#) .
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#) 
-  Faculty hires of true Complex Systems scholars.

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):













-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#), [ALife 2020](#).
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#)
-  Faculty hires of true Complex Systems scholars.
-  Numerous NSF CAREER awards (including PECASE).

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):














-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#), [ALife 2020](#).
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#)
-  Faculty hires of true Complex Systems scholars.
-  Numerous NSF CAREER awards (including PECASE).
-  Connecting Graduate and Undergraduate Students across campus (SCRaPS).

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Vermont Complex Systems Center (2006–):

-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#), [ALife 2020](#).
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#)
-  Faculty hires of true Complex Systems scholars.
-  Numerous NSF CAREER awards (including PECASE).
-  Connecting Graduate and Undergraduate Students across campus (SCRaPS).
-  Paper Shredder, Research Jam, and ComplexiTea.










Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References



Vermont Complex Systems Center (2006–):

-  Diverse research and teaching portfolio (> 400 papers in 2010–2015).
-  Funding from many sources: NSF, NIH, DARPA, Microsoft, MITRE, Computer Associates, MassMutual, Google, foundations.
-  Regular global press coverage: NYT, BBC, WaPo, NatGeo, ...
-  Conferences: “Big Data, Big Stories”, “Big Scale, Big Fail”, “Prediction: the Next Big Thing”, [NetSci 2019](#), [ALife 2020](#).
-  Fully developed educational platform in Complex Systems and Data Science.
-  [Complex Networks Winter Workshops in Quebec City \(“Canoe”\)](#)
-  Faculty hires of true Complex Systems scholars.
-  Numerous NSF CAREER awards (including PECASE).
-  Connecting Graduate and Undergraduate Students across campus (SCRaPS).
-  Paper Shredder, Research Jam, and ComplexiTea.
-  [Talkboctopus](#)

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References



Major support:



MassMutual Center for Excellence in Complex Systems and Data Science

vermontcomplexsystems.org/partner/MMCOE/



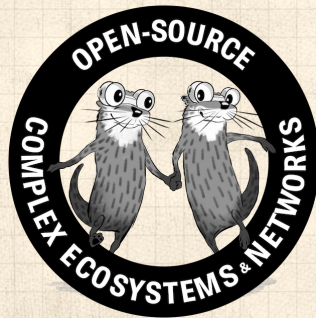
University of Vermont-Google Open-Source Complex Ecosystems And Networks (OCEAN)

vermontcomplexsystems.org/partner/OCEAN/

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References



Vermont Complex Systems Center—Misfit toys:



Peter
Dodds,
Math/Stats



Josh
Bongard, CS



Chris
Danforth,
Math/Stats



Maggie
Eppstein, CS



Juniper
Lovato,
Education



Hugh
Garavan,
Neuro,
Psychiatry



Jane Adams,
Digital Artist



Safwan
Wshah, CS



Jim Bagrow,
Math/Stats



Paul Hines,
EE



Brian
Tivnan,
MITRE



Puck
Rombach,
Math/Stats




Laurent
Hébert-
Dufresne,
CS


Orientation


Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects


References


We're interested in many things:

 Sociotechnical systems


 Social Contagion and Influence


 Happiness and Well-being


 Language and Stories


 Social unrest


 Conflict


 Robotics


 Artificial Intelligence


 Complex Networks


 Climate


 Biology


 Ecology

 Geomorphology


 Space


 Complex Fluids


 (Smart) Power Grids


 Critical infrastructure


 Defense


 Public Policy


 Health and Medicine


 Brainz Brains


 Neuroscience


 Food systems


 Epidemiology

 Pandemics


 Organizations

 Economics


 Wealth inequality

 Financial Systems


Leveling up—Scaffolded educational mission:

 Data Science Undergrad.




 Graduate Certificate in
Complex Systems and
Data Science



 Fall, 2015–: MS in Complex
Systems and Data Science









 Fall, 2018–: PhD in The
Study of Interesting Things
Complex Systems and
Data Science




All the words: <http://vermontcomplexsystems.org> 

Graduate Certificate in Complex Systems (and Data Science):

-  Principles of Complex Systems is one of three core requirements for UVM's five course Certificate of Graduate Study in Complex Systems .
-  Prof. Laurent Hebert-Dufresne's "Modelling Complex Systems" (CSYS/CS 302).
-  Prof. Jim Bagrow's "Data Science I" (STAT 287)
-  The Sequel to PoCS: "Complex Networks" (CSYS/MATH 303).
-  In fact:
Principles of Complex Systems Vols. 1 and 2

Framing (funfully):

Science = Area of study + Instruments of study

 Stars and Telescopes

PoCS, Vol. 1
What's the John
Dory?
13 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards

Projects

References

Framing (funfully):

Science = Area of study + Instruments of study

 Stars and Telescopes = Astronomy

PoCS, Vol. 1
What's the John
Dory?
13 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards


Projects

References

Framing (funfully):

Science = Area of study + Instruments of study

 Stars and Telescopes = Astronomy

 Rocks and Hammers

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards


Projects

References

Framing (funfully):

Science = Area of study + Instruments of study

 Stars and Telescopes = Astronomy

 Rocks and Hammers = Geology

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

Framing (funfully):

Science = Area of study + Instruments of study



Stars and Telescopes = Astronomy



Rocks and Hammers = Geology



Water and Partial Differential Equations

Framing (funfully):

Science = Area of study + Instruments of study



Stars and Telescopes = Astronomy







Rocks and Hammers = Geology



Water and Partial Differential Equations = Fluid Dynamics





Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines






Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience






Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception







Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology

Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics







Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References








Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics = Pure mathematics








Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics = Pure mathematics
-  Mind and Mind









Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics = Pure mathematics
-  Mind and Mind = Psychotherapy, Insight meditation, ...









Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics = Pure mathematics
-  Mind and Mind = Psychotherapy, Insight meditation, ...
-  Complex Systems + Data Science

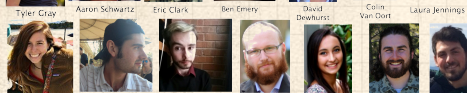
Framing (funfully):

Science = Area of study + Instruments of study

-  Stars and Telescopes = Astronomy
-  Rocks and Hammers = Geology
-  Water and Partial Differential Equations = Fluid Dynamics
-  Brains and Giant Imaging Machines = Neuroscience
-  People and Deception = Social Psychology
-  Mathematics and Mathematics = Pure mathematics
-  Mind and Mind = Psychotherapy, Insight meditation, ...
-  Complex Systems + Data Science = Postdisciplinary Systems Science



Michael Arnold Jane Adams Todd DeLuca Sophie Hodson Sandhya Gopchandran Anne Marie Stupinski Summer Jang



Tyler Gray Aaron Schwartz Eric Clark Ben Emery David Dewhurst Cainn Van Dort Laura Jennings



Abby Ross Northfield Mount Harmon School
Chris Easting Data Science Consultant
Ryan Callagher Northeastern PhD student
John Ring
Lindsay Ross
Brendan Whitney
Henry Mitchell



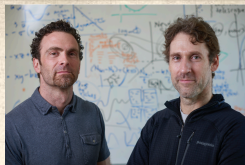
Nick Allgeier Psychiatry Res Asst Prof
Dylan Kiley Chobanian Group
Tom Mohrweid Cardiovascular Research foundation
Emily Casey Data Scientist Adobe
Morgan Frank MIT Media Lab PhD Student
Cathy Bliss UVM Lecturer
Mark Ibrahim Data Scientist Insight



Ross Lind Lappen Dartmouth PhD Cold Regions Research & Engineering Laboratory
Lillian Pechebeck Maine School of Science & Math
Andy Reagan Data Scientist MassMutual
Sven McCall Maps, Apple



Lewis Mitchell Adelaide Faculty
Jake Williams Drexel Faculty
Isuhil Kleumuntz Cornell PhD Facebook Data Scientist
Fletcher Hazlehurst
Sharon Alajajian Research Scientist Univ of Pennsylvania
Kameron Harris U Washington Postdoc
Paul Lessard Colorado PhD Student
Sumta Desai Apple Data Scientist
Mike Foley Northeastern PhD student
Garey Glenn Climate Science UC London, MS student
Lindsay Van Lier VC+IP



Chris Danforth Peter Dodds



Sarah Howerter Käyla Horak U of Wisconsin



compstorylab.org

PoCS, Vol. 1
What's the John Dory?
14 of 59

Orientation
Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References



Funding: NSF, NIH, NIDA, NASA, MITRE, James S. McDonnell Foundation, ONR, DARPA, MassMutual, Google, Computer Associates; [YOUR WONDERFUL FUNDING AGENCY HERE]





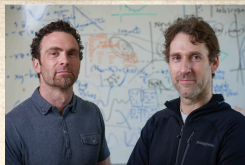
Michael Arnold Jane Adams Todd DeLuca Sophie Hodson Sandhya Gopchandran Anne Marie Stupinski Summer Jang



Tyler Gray Aaron Schwartz Eric Clark Ben Emery David Dewhurst Cainn Van Dort Laura Jennings



Abby Ross
Northfield Mount
Harrison School
Chris Easting
Data Science
Consultant
Ryan Gallagher
Northeastern
PhD student
John Ring
Lindsay Ross
Brendan
Whitney
Henry
Mitchell



Chris Danforth Peter Dodds



Sarah Howerter



compstorylab.org



Käyla Horak
U of Wisconsin

PoCS, Vol. 1
What's the John
Dory?
14 of 59

Orientation
Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References




Nick Allgaier
Psychiatry
Res Asst Prof
Dilan Riley
Chobanian Group
Tom Mohrnew
Cardiovascular
Research foundation
Emily Casey
Data Scientist
Adobe
Morgan Frank
MIT Media Lab
PhD Student
Cathy Bliss
UVM Lecturer
Mark Ibrahim
Data Scientist
Insight




Ross Lind
Lapin
Dartmouth PhD
Cold Regions Research
& Engineering Laboratory
Liam Pechebeck
Maine School of
Science & Math
Andy Reagan
Data Scientist
MassMutual
Sven McCall
Maps, Apple




Lewis Mitchell
Adelaide Faculty
Jake Williams
Drexel Faculty
Rubel Kleummt
Cornell PhD
Facebook
Data Scientist
Fletcher
Hazierhurst
Sharon Alajajian
Research Scientist
Univ of Pennsylvania
Kameron Harris
U Washington
Postdoc
Paul Lessard
Colorado
PhD Student
Suma Desai
Apple
Data Scientist
Mike Foley
Northeastern
PhD student
Darcy Glenn
Climate Science
UC London, MS student
Lindsay Van Lier
VC-IP

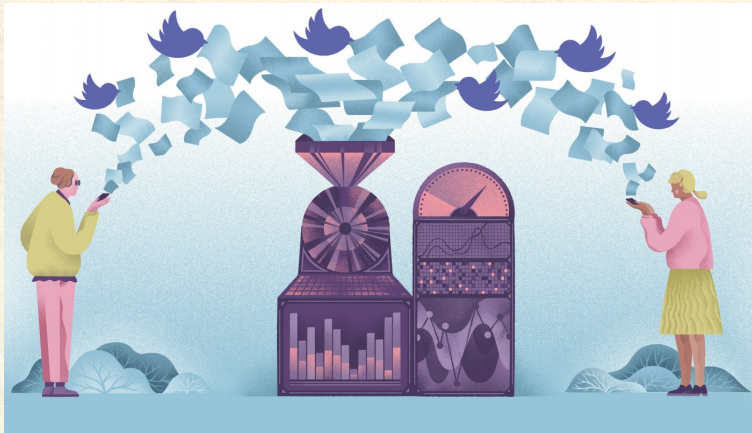
 Funding: NSF, NIH, NIDA, NASA, MITRE, James S. McDonnell Foundation, ONR, DARPA, MassMutual, Google, Computer Associates; [YOUR WONDERFUL FUNDING AGENCY HERE]

 Adjacent: Strava Story Lab team



Outside

Inside the Lab that's Quantifying Happiness 
by Rowan Jacobsen, August 2017.
(Reprinted in UVM Quarterly, 2018.)



PoCS, Vol. 1
What's the John
Dory?
15 of 59



Orientation



Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects



References







Courses:



 CSYS/MATH 300: Principles of Complex Systems (@pocsvox )



 CSYS/MATH 303: Complex Networks (@networksvox )

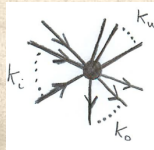
 MATH 124/122: Matrixology (Linear Algebra) (@matrixologyvox and @svdthematrices )

 MATH 237: Numerical Analysis (@MachEps237 )

 MATH 266: Chaos, fractals & dynamical systems (@NonperiodicFlow )

 MATH 330: Ordinary Differential Equations (@dallthethingsdt )

 Courses act as research incubators and have helped generate many papers  (60+)



Outline

PoCS, Vol. 1
What's the John
Dory?
18 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards









Projects

References

References



Basics:

-  Instructor: Prof. Peter Sheridan Dodds
-  Lecture room and meeting times:
Online, To be sorted out
-  Office: (in theory) Innovation, fourth floor
-  email: peter.dodds@uvm.edu
-  Course Website:
<http://www.uvm.edu/pdodds/teaching/courses/2020-08UVM-300> 
-  Course Twitter handle: @pocsvox
-  Course hashtag: #FallPoCSVol12020

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References

Potential paper products:

 The Syllabus  and a Poster .



Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards


Projects

References

Potential paper products:

 [The Syllabus](#)  and a [Poster](#) .

Office hours:

 Tuesdays, 12 to 12:50 pm; Wednesdays, 1:15 pm to 2:05 pm; Thursdays, 12 to 12:50 pm; all scheduled on Teams, Innovation, fourth floor



Exciting details regarding these slides:



Three versions (all in pdf):

1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).

PoCS, Vol. 1
What's the John
Dory?
21 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



Exciting details regarding these slides:




Three versions (all in pdf):

1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are **hyperly navigable**:

 back + search + forward.



Exciting details regarding these slides:



Three versions (all in pdf):


1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



~~Presentation versions are hyperly navigable:~~

~~⏪ ⏩ ≡ back + search + forward.~~



Web links look like this .



Exciting details regarding these slides:



Three versions (all in pdf):

1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are hyperly navigable:

back + search + forward.



Web links look like this



References in slides link to full citation at end. ^[1]



Exciting details regarding these slides:




Three versions (all in pdf):


1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are **hyperly navigable**:

 back + search + forward.



Web links look like this .



References in slides link to full citation at end. [1]



Citations contain links to pdfs for papers (if available).



Exciting details regarding these slides:




Three versions (all in pdf):


1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are **hyperly navigable**:

 back + search + forward.



Web links look like this .



References in slides link to full citation at end. ^[1]



Citations contain links to pdfs for papers (if available).



Some books will be linked to on Amazon.



Exciting details regarding these slides:



Three versions (all in pdf):

1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are hyperly navigable:

back + search + forward.



Web links look like this



References in slides link to full citation at end. ^[1]



Citations contain links to pdfs for papers (if available).



Some books will be linked to on Amazon.



Brought to you by a frightening melange of X₃AT_EX , Beamer , perl , PerlTeX , fevered command-line madness , and an almost fanatical devotion to the indomitable emacs .



Exciting details regarding these slides:



Three versions (all in pdf):

1. Presentation,
2. Flat Presentation,
3. Handout (3x2 slides per page).



Presentation versions are hyperly navigable:

back + search + forward.



Web links look like this



References in slides link to full citation at end. ^[1]



Citations contain links to pdfs for papers (if available).



Some books will be linked to on Amazon.



Brought to you by a frightening melange of X₃AT_EX , Beamer , perl , PerlTeX , fevered command-line madness , and an almost fanatical devotion to the indomitable emacs .
#evilsuperpowers



More super exciting details:



We use Open Sans and make math look good:

```
\setmainfont[Ligatures=TeX]{Open Sans}  
\setsansfont[Ligatures=TeX]{Open Sans}  
\usefonttheme[onlymath]{serif}
```



Still working towards putting the course on
Github/Gitlab



And finishing writing the books ...



Yet more super exciting details:

PoCS, Vol. 1
What's the John
Dory?
23 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



Yet more super exciting details:



This is Season 15 of Principles of Complex Systems, Vol. 1.

PoCS, Vol. 1
What's the John Dory?
23 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



Yet more super exciting details:



This is Season 15 of Principles of Complex Systems, Vol. 1.



Lectures will be called Episodes.

PoCS, Vol. 1
What's the John
Dory?
23 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc




Tarot Cards

Projects

References



Yet more super exciting details:

-  This is Season 15 of Principles of Complex Systems, Vol. 1.
-  Lectures will be called Episodes.
-  Episodes will be broken into clips.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc





Tarot Cards

Projects

References



Yet more super exciting details:

-  This is Season 15 of Principles of Complex Systems, Vol. 1.
-  Lectures will be called Episodes.
-  Episodes will be broken into clips.
-  2020 on: new clips will be recorded in a pretend studio.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc








Tarot Cards

Projects

References



Yet more super exciting details:

-  This is Season 15 of Principles of Complex Systems, Vol. 1.
-  Lectures will be called Episodes.
-  Episodes will be broken into clips.
-  2020 on: new clips will be recorded in a pretend studio.
-  All lectures are bottle  episodes .

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc










Tarot Cards

Projects

References



Yet more super exciting details:

-  This is Season 15 of Principles of Complex Systems, Vol. 1.
-  Lectures will be called Episodes.
-  Episodes will be broken into clips.
-  2020 on: new clips will be recorded in a pretend studio.
-  All lectures are bottle  episodes .
-  Other tropes  will be involved.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc












Tarot Cards

Projects

References







Yet more super exciting details:

-  This is Season 15 of Principles of Complex Systems, Vol. 1.
-  Lectures will be called Episodes.
-  Episodes will be broken into clips.
-  2020 on: new clips will be recorded in a pretend studio.
-  All lectures are bottle  episodes .
-  Other tropes  will be involved.
-  Last season's Episodes are here .









Wonderful foundational support for PoCS and CoNKS CocoNuTs has come from the NSF:

-  "CAREER: Explorations of Complex Social and Psychological Phenomena through Multiscale Online Sociological Experiments, Empirical Studies, and Theoretical Models." 2009–2015.
-  SES Division of Social and Economic Sciences
SBE Directorate for Social, Behavioral & Economic Sciences
-  Abstract is [here](#) .



Wonderful foundational support for PoCS and CoNKS CocoNuTs has come from the NSF:


-  "CAREER: Explorations of Complex Social and Psychological Phenomena through Multiscale Online Sociological Experiments, Empirical Studies, and Theoretical Models." 2009–2015.
-  SES Division of Social and Economic Sciences
SBE Directorate for Social, Behavioral & Economic Sciences
-  Abstract is [here](#) .

-  People have also [said nice things about PoCS](#) 



Team PoCS

Microsoft Teams + Slack

 Teams = main place for discussions about all things PoCS including assignments and projects.

PoCS, Vol. 1
What's the John
Dory?
25 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects



References



Team PoCS

PoCS, Vol. 1
What's the John
Dory?
25 of 59

Microsoft Teams + Slack

-  Teams = main place for discussions about all things PoCS including assignments and projects.
-  Slack = main place for students and faculty in Complex Systems and Data Science to talk about everything.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects




References



Team PoCS

PoCS, Vol. 1
What's the John
Dory?
25 of 59

Microsoft Teams + Slack

-  Teams = main place for discussions about all things PoCS including assignments and projects.
-  Slack = main place for students and faculty in Complex Systems and Data Science to talk about everything.
-  Teams—Automatic if enrolled in the course.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc





Tarot Cards

Projects

References



Microsoft Teams + Slack

-  Teams = main place for discussions about all things PoCS including assignments and projects.
-  Slack = main place for students and faculty in Complex Systems and Data Science to talk about everything.
-  Teams—Automatic if enrolled in the course.
-  Slack—Once invited, please sign up here:
<https://csdsgrads.slack.com/>

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects






References



Team PoCS

PoCS, Vol. 1
What's the John
Dory?
25 of 59

Microsoft Teams + Slack

-  Teams = main place for discussions about all things PoCS including assignments and projects.
-  Slack = main place for students and faculty in Complex Systems and Data Science to talk about everything.
-  Teams—Automatic if enrolled in the course.
-  Slack—Once invited, please sign up here:
<https://csdsgrads.slack.com/>
-  Very good: Install Microsoft and Slack apps on laptops, tablets, phone, cats, dogs. Nothing will go wrong.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc







Tarot Cards

Projects

References



Microsoft Teams + Slack

-  Teams = main place for discussions about all things PoCS including assignments and projects.
-  Slack = main place for students and faculty in Complex Systems and Data Science to talk about everything.
-  Teams—Automatic if enrolled in the course.
-  Slack—Once invited, please sign up here:
<https://csdsgrads.slack.com/>
-  Very good: Install Microsoft and Slack apps on laptops, tablets, phone, cats, dogs. Nothing will go wrong.
-  Everyone will behave wonderfully.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards


Projects


References



Grading breakdown:

 **Assignments (75%)**—All assignments will be of equal weight and there will be 10 ± 1 of them.

 **Projects/talks (24%)**—Students will work on semester-long projects. Students will develop a proposal in the first few weeks of the course which will be discussed with the instructor for approval. Details: 8% for the first talk, 8% for the final talk, and 8% for the written project.

 **General attendance/Class participation (1%)**—Everyone is expected to behave well.



How grading works:

Orientation

Course Information

Centers, Books, Resources

Topics





Narrative Arc

Tarot Cards

Projects

References

Questions are worth 3 points according to the following scale:

-  3 = correct or very nearly so.
-  2 = acceptable but needs some revisions.
-  1 = needs major revisions.
-  0 = way off.



Important things:

1. Classes run from Monday, August 31 to Friday, December 4.
2. Add/Drop, Audit, Pass/No Pass deadline—Monday, September 14.
3. Last day to withdraw—Thursday, October 29 (Sadness!).
4. Reading and Exam period—Monday, December 7 to Friday, December 11.

Do check the course Twitter account, @pocsvox, for updates regarding the course (part of the course site).

Academic assistance: Anyone who requires assistance in any way (as per the ACCESS program or due to athletic endeavors), please see or contact me as soon as possible.



Outline

PoCS, Vol. 1
What's the John
Dory?
29 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References

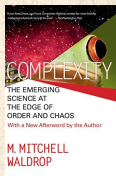
References



Popular Science Books:

PoCS, Vol. 1
What's the John
Dory?
30 of 59

Historical artifact:



“Complexity: The Emerging Science at the
Edge of Order and Chaos” [a](#) [↗](#)
by M. Mitchell Waldrop (1993).^[16]

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

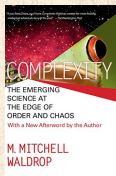
References



Popular Science Books:

PoCS, Vol. 1
What's the John
Dory?
30 of 59

Historical artifact:



“Complexity: The Emerging Science at the Edge of Order and Chaos” [a](#) [↗](#)
by M. Mitchell Waldrop (1993). ^[16]

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References

Shout-out: Dr. Andrew P. Morokoff [↗](#),
MBBS PhD FRACS D.Thau (Bug) [↗](#)



Popular Science Books:

PoCS, Vol. 1
What's the John
Dory?
31 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

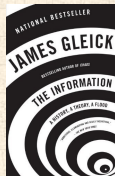
References



“Simply Complexity: A Clear Guide to Complexity Theory” [a](#) [🔗](#)
by Neil F. Johnson (2009). ^[9]



“Complexity: A Guided Tour” [a](#) [🔗](#)
by Melanie Mitchell (2009). ^[12]



“The Information: A History, A Theory, A Flood” [a](#) [🔗](#)
by James Gleick (2011). ^[6]



Books on Complexification:

PoCS, Vol. 1
What's the John
Dory?
32 of 59

Orientation

Course Information

Centers, Books, Resources

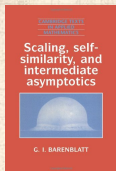
Topics

Narrative Arc

Tarot Cards

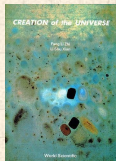
Projects

References



"Scaling, self-similarity, and intermediate asymptotics" [a](#) [↗](#)
by G. I. Barenblatt (1996). ^[3]

Have to strongly disrecommmend "Scale" by West. No.



"Creation of the Universe" [a](#) [↗](#)
by Zhi and Xian (1989). ^[17]

See Freeman Dyson's [↗](#) The Key to Everything [↗](#).



On complex sociotechnical systems:

PoCS, Vol. 1
What's the John
Dory?
33 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

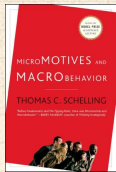
Tarot Cards

Projects

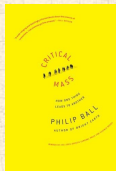
References



“Human Behaviour and the Principle of Least-Effort” [a](#) [↗](#)
by G. K. Zipf (1949). [18]



“Micromotives and Macrobehavior” [a](#) [↗](#)
by Thomas C. Schelling (1978). [14]



“Critical Mass: How One Thing Leads to Another” [a](#) [↗](#)
by Philip Ball (2004). [2]



It's all about algorithms (stories):

PoCS, Vol. 1
What's the John
Dory?
34 of 59



"The Engine of Complexity: Evolution as Computation" [a](#) [↗](#)

by John E. Mayfield (2013). ^[10]



"On the Origin of Stories: Evolution, Cognition, and Fiction" [a](#) [↗](#)

by Brian Boyd (2010). ^[5]



"The Storytelling Animal: How Stories Make Us Human" [a](#) [↗](#)

by Jonathan Gottschall (2013). ^[7]

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

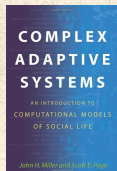
Tarot Cards

Projects

References

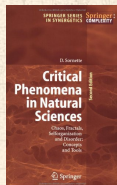


A few textbooky books (dated):



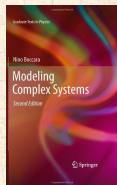
“Complex Adaptive Systems: An introduction to computational models of social life” [a](#) [↗](#)

by Miller and Page (2007). [11]



“Critical Phenomena in Natural Sciences” [a](#) [↗](#)

by Didier Sornette (2003). [15]



“Modeling Complex Systems” [a](#) [↗](#)

by Nino Boccara (2004). [4]

Eventually: “Principles of Complex Systems”

PoCS, Vol. 1
What's the John
Dory?
35 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc













Tarot Cards

Projects

References



Centers:

-  Santa Fe Institute (SFI)
-  Networks Institute at Northeastern
-  Northwestern Institute on Complex Systems
([NICO](#) )
-  MIT Institute for Data, Systems, AND Society
-  New England Complex Systems Institute (NECSI)
-  Michigan's Center for the Study of Complex
Systems ([CSCS](#) )
-  Some Data Science groups (highly variable)
-  Also: Indiana, Davis, Brandeis, University of
Illinois, Duke, Warsaw, Melbourne, ...,
-  Us!!!: [Vermont Complex Systems Center](#) 



Orientation

Course Information

[Centers, Books, Resources](#)

Topics

Narrative Arc

Tarot Cards

Projects

References



Other inputs:

PoCS, Vol. 1
What's the John
Dory?
37 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

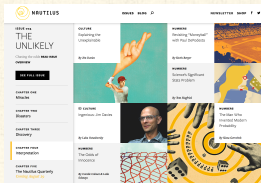
References



Complexity Digest:

<http://www.comdig.org>

<https://twitter.com/@cxdig>



Nautilus Magazine:

<http://nautil.us/>



Aeon: <http://aeon.co/>



Quanta Magazine:

<https://www.quantamagazine.org/>



Outline

PoCS, Vol. 1
What's the John
Dory?
38 of 59

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc
Tarot Cards
Projects

References

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc
Tarot Cards
Projects

References



The nature of PoCS:



Transitional from standard coursework to research-focused work.

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



The nature of PoCS:



Transitional from standard coursework to research-focused work. **#alittle scary**

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



The nature of PoCS:



Transitional from standard coursework to research-focused work. #alittle scary

Major themes:

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



The nature of PoCS:



Transitional from standard coursework to research-focused work. #alittle scary

Major themes:



The Complexity Manifesto ;

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards

Projects



References




The nature of PoCS:

 Transitional from standard coursework to research-focused work. **#alittle scary**

Major themes:

 The Complexity Manifesto ;

 Complex Systems \equiv Modern, Normal Science;

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics


Narrative Arc

Tarot Cards



Projects


References


The nature of PoCS:

 Transitional from standard coursework to research-focused work. #alittle scary


Major themes:

 The Complexity Manifesto ;



 Complex Systems \equiv Modern, Normal Science;


 Roles and limits of Data, Theory, and Experiment;


The nature of PoCS:


 Transitional from standard coursework to research-focused work. #alittle scary

Major themes:


 The Complexity Manifesto 

 Complex Systems \equiv Modern, Normal Science;



 Roles and limits of Data, Theory, and Experiment;


 Emergence;


The nature of PoCS:


 Transitional from standard coursework to research-focused work. #alittle scary


Major themes:

 [The Complexity Manifesto](#) ;

 Complex Systems \equiv Modern, Normal Science;

 Roles and limits of Data, Theory, and Experiment;

 Emergence;

 Universality and Accidents of History;

PoCS, Vol. 1
What's the John
Dory?
39 of 59

Orientation

Course Information

Centers, Books, Resources

Topics


Narrative Arc

Tarot Cards



Projects


References


The nature of PoCS:


 Transitional from standard coursework to research-focused work. #alittlescary


Major themes:


 The Complexity Manifesto 

 Complex Systems \equiv Modern, Normal Science;

 Roles and limits of Data, Theory, and Experiment;

 Emergence;

 Universality and Accidents of History;

 Structure and Stories: Micro-to-macro Mechanisms;

Orientation

Course Information

Centers, Books, Resources

Topics


Narrative Arc

Tarot Cards









Projects

References

The nature of PoCS:

 Transitional from standard coursework to research-focused work. #alittle scary

Major themes:

-  [The Complexity Manifesto](#) ;
-  Complex Systems \equiv Modern, Normal Science;
-  Roles and limits of Data, Theory, and Experiment;
-  Emergence;
-  Universality and Accidents of History;
-  Structure and Stories: Micro-to-macro Mechanisms;
-  Elements: Scaling, Surprise, Networks, Robustness, Failure, and Spreading.

Orientation

Course Information
Centers, Books, Resources

Topics


Narrative Arc
Tarot Cards
Projects

References

The nature of PoCS:

- Transition from standard coursework to research-focused work. #alittle scary

Major themes:

- The Complexity Manifesto 
- Complex Systems \equiv Modern, Normal Science;
- Roles and limits of Data, Theory, and Experiment;
- Emergence;
- Universality and Accidents of History;
- Structure and Stories: Micro-to-macro Mechanisms;
- Elements: Scaling, Surprise, Networks, Robustness, Failure, and Spreading.
- The Theory of Anything: Why Complexify?

Orientation

Course Information
Centers, Books, Resources

Topics


Narrative Arc
Tarot Cards
Projects

References

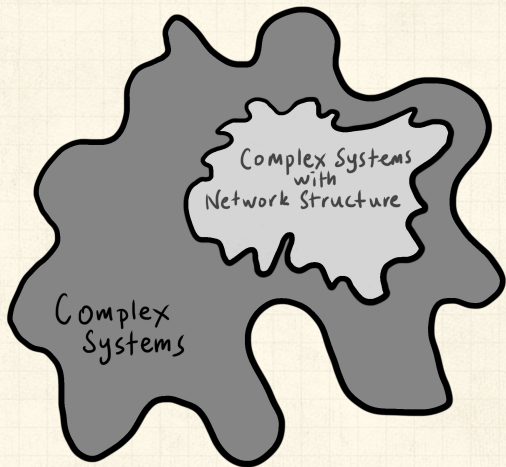
The nature of PoCS:

- Transitional from standard coursework to research-focused work. #alittle scary

Major themes:

- The Complexity Manifesto 
- Complex Systems \equiv Modern, Normal Science;
- Roles and limits of Data, Theory, and Experiment;
- Emergence;
- Universality and Accidents of History;
- Structure and Stories: Micro-to-macro Mechanisms;
- Elements: Scaling, Surprise, Networks, Robustness, Failure, and Spreading.
- The Theory of Anything: Why Complexify?
- It's all about stories.

Complex Systems are the Big Story:



Only a bit networky: Fluids-at-large (the atmosphere, oceans, ...), organism cells, ...

PoCS, Vol. 1
What's the John
Dory?
40 of 59

Orientation

Course Information
Centers, Books, Resources

Topics
Narrative Arc

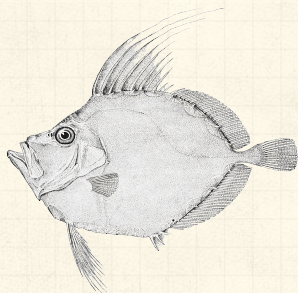
Tarot Cards
Projects

References



Cryptolect:

Course mascot:



What's the Story?

PoCS, Vol. 1
What's the John
Dory?
41 of 59

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

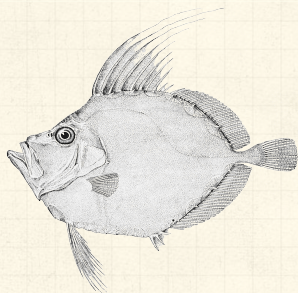
Projects


References




Cryptolect:

Course mascot:



 What's the Story?

 What's the John Dory?

PoCS, Vol. 1
What's the John
Dory?
41 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

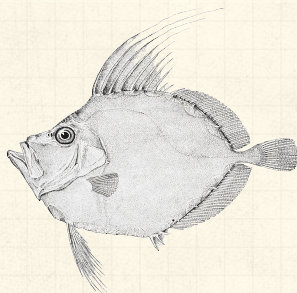
Projects





References



Cryptolect:

Course mascot:



-  What's the Story?
-  What's the John Dory?
-  What's the John Dory for Rhyming Slang ?

PoCS, Vol. 1
What's the John
Dory?
41 of 59

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

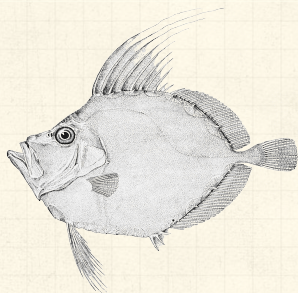
Projects






References



Cryptolect:

Course mascot:



-  What's the Story?
-  What's the John Dory?
-  What's the John Dory for Rhyming Slang ?
-  Hemiteleia: beers \Rightarrow Edward Lears \Rightarrow Edwards.

PoCS, Vol. 1
What's the John
Dory?
41 of 59

Orientation

Course Information
Centers, Books, Resources

Topics

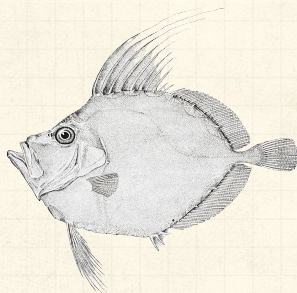
Narrative Arc
Tarot Cards
Projects








References



Cryptolect:

Course mascot:



-  What's the Story?
-  What's the John Dory?
-  What's the John Dory for Rhyming Slang ?
-  Hemiteleia: beers \Rightarrow Edward Lears \Rightarrow Edwards.
-  Also: Taxis \Rightarrow Boris Spasskies  \Rightarrow Borises

PoCS, Vol. 1
What's the John
Dory?
41 of 59

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards











Projects

References








Topics:

Scaling phenomena:

-  Allometry.
-  Scaling of social phenomena: crime, creativity, and consumption.
-  Scaling in biology (elephants and platypuses).
-  Dimensional Analysis and Renormalization.
-  Power law size distributions and non-Gaussian statistics.
-  The 80/20 rule, the 1%.
-  Zipf's law.
-  Order from randomness.
-  Fundamental mechanisms for generating power law size distributions.
-  The rich-get-richer mechanism.

Topics:

Robustness—Integrity of complex systems:

-  Generic failure mechanisms.
-  Highly Optimized Tolerance (HOT): Robustness and fragility.
-  How to build optimal forests.
-  Minimization of risk as a driver of heterogeneous structures in complex systems.
-  How to optimally locate facilities: hospitals, schools, and coffee shops.

Orientation

Course Information
Centers, Books, Resources






Topics

Narrative Arc
Tarot Cards
Projects





References

Topics:

Robustness—Integrity of complex systems:









-  Generic failure mechanisms.
-  Highly Optimized Tolerance (HOT): Robustness and fragility.
-  How to build optimal forests.
-  Minimization of risk as a driver of heterogeneous structures in complex systems.
-  How to optimally locate facilities: hospitals, schools, and coffee shops.

Fundamentals of Complexity:

-  Emergence: More is Different.
-  Measurement and mismeasurement.
-  Universality versus path dependence.
-  Complexification (it all starts with gravity^[17]).

Topics:

Complex networks:

-  Statistical Mechanics
-  Structure and Dynamics
-  Phase transitions
-  Random Networks
-  Scale-free Networks
-  Small-world Networks
-  Why your friends are better than you.
-  More in PoCS, Vol. 2 in the spring.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References

Topics:

PoCS, Vol. 1
What's the John
Dory?
45 of 59

Orientation

Course Information

Centers, Books, Resources

Topics









Narrative Arc

Tarot Cards

Projects






References

Sociotechnical Systems:

-  Biological and social spreading models
-  Schelling's model of segregation ^[13]
-  Granovetter's model of imitation ^[8]
-  Collective behavior and synchrony
-  Global cooperation from bad actors
-  Global conflicts from good actors
-  Stories (Homo Narrativus)
-  The Sociotechnocene

Topics:

Collective decision making:

-  Wisdom and madness of crowds.
-  Systems of voting.
-  The role of randomness and chance.
-  Success inequality.
-  The paradox of unpredictable global fame.

Orientation

Course Information
Centers, Books, Resources

Topics







Narrative Arc
Tarot Cards
Projects

References



Topics:

Collective decision making:

-  Wisdom and madness of crowds.
-  Systems of voting.
-  The role of randomness and chance.
-  Success inequality.
-  The paradox of unpredictable global fame.
-  Bonus knowledge: How to make things spread.

Orientation

Course Information
Centers, Books, Resources

Topics








Narrative Arc
Tarot Cards
Projects

References



Topics:

Collective decision making:

-  Wisdom and madness of crowds.
-  Systems of voting.
-  The role of randomness and chance.
-  Success inequality.
-  The paradox of unpredictable global fame.
-  Bonus knowledge: How to make things spread.
-  Bonus knowledge: Fate does not exist in a world of fame.

Orientation

Course Information
Centers, Books, Resources

Topics








Narrative Arc
Tarot Cards
Projects

References







Topics:

Collective decision making:

-  Wisdom and madness of crowds.
-  Systems of voting.
-  The role of randomness and chance.
-  Success inequality.
-  The paradox of unpredictable global fame.
-  Bonus knowledge: How to make things spread.
-  Bonus knowledge: Fate does not exist in a world of fame.

Large-scale social patterns (maybe):

-  Movement
-  Cities
-  Happiness
-  Social media

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc
Tarot Cards
Projects

References



Outline

PoCS, Vol. 1
What's the John
Dory?
47 of 59

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects


References

References



Season's Narrative Arc (or Places We Will Go):



Overview of Complex Systems with bonus
Manifesto .

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards


Projects

References



Season's Narrative Arc (or Places We Will Go):



Overview of Complex Systems with bonus
Manifesto .



Thread of Understanding Sociotechnical Systems.

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards


Projects

References



Season's Narrative Arc (or Places We Will Go):



Overview of Complex Systems with bonus
Manifesto .



Thread of Understanding Sociotechnical Systems.



Allometric scaling in complex systems.

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards


Projects

References



Season's Narrative Arc (or Places We Will Go):



Overview of Complex Systems with bonus
Manifesto 



Thread of Understanding Sociotechnical Systems.



Allometric scaling in complex systems.



Size distributions of system elements:

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc







Tarot Cards

Projects

References



Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc








Tarot Cards

Projects

References



Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.
 -  Description and Mechanisms of Becoming.

PoCS, Vol. 1
What's the John
Dory?
48 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc









Tarot Cards

Projects

References



Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.
 -  Description and Mechanisms of Becoming.
-  Robustness of Complex Systems.

Orientation

Course Information
Centers, Books, Resources
Topics










Narrative Arc

Tarot Cards
Projects

References




Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.
 -  Description and Mechanisms of Becoming.
-  Robustness of Complex Systems.
-  Complex networks—how system elements are connected:



Season's Narrative Arc (or Places We Will Go):



Overview of Complex Systems with bonus
Manifesto .



Thread of Understanding Sociotechnical Systems.



Allometric scaling in complex systems.



Size distributions of system elements:



Power-law size distributions.



Description and Mechanisms of Becoming.



Robustness of Complex Systems.














Complex networks—how system elements are
connected:



Structure, Growth Mechanisms, Processes on
Networks.















Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.
 -  Description and Mechanisms of Becoming.
-  Robustness of Complex Systems.
-  Complex networks—how system elements are connected:
 -  Structure, Growth Mechanisms, Processes on Networks.
-  Social Contagion, Voting, Fame and Fate, Stories.



Season's Narrative Arc (or Places We Will Go):

-  Overview of Complex Systems with bonus Manifesto .
-  Thread of Understanding Sociotechnical Systems.
-  Allometric scaling in complex systems.
-  Size distributions of system elements:
 -  Power-law size distributions.
 -  Description and Mechanisms of Becoming.
-  Robustness of Complex Systems.
-  Complex networks—how system elements are connected:
 -  Structure, Growth Mechanisms, Processes on Networks.
-  Social Contagion, Voting, Fame and Fate, Stories.
-  Complexification: The Theory of Anything and the Rise of Algorithms



Outline

PoCS, Vol. 1
What's the John
Dory?
49 of 59

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

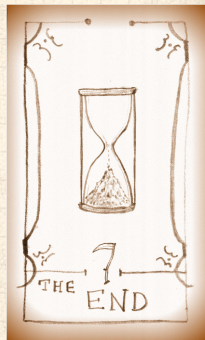
Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

References

References





Outline

PoCS, Vol. 1
What's the John
Dory?
51 of 59

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects

Orientation

Course Information
Centers, Books, Resources
Topics
Narrative Arc
Tarot Cards
Projects
References

References



Projects



Semester-long projects, teams.

PoCS, Vol. 1
What's the John
Dory?
52 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc

Tarot Cards

Projects

References



Projects



Semester-long projects, teams.



Develop proposal in first few weeks.

PoCS, Vol. 1
What's the John
Dory?
52 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc




Tarot Cards

Projects

References



Projects

-  Semester-long projects, teams.
-  Develop proposal in first few weeks.
-  May range from novel research to investigation of an established area of complex systems.

Orientation

Course Information
Centers, Books, Resources

Topics

Narrative Arc





Tarot Cards

Projects

References



Projects

-  Semester-long projects, teams.
-  Develop proposal in first few weeks.
-  May range from novel research to investigation of an established area of complex systems.
-  Two talks + written piece.

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc







Tarot Cards

Projects

References










Projects

-  Semester-long projects, teams.
-  Develop proposal in first few weeks.
-  May range from novel research to investigation of an established area of complex systems.
-  Two talks + written piece.
-  Usage of the VACC  is encouraged (ability to code well = super powers).











Projects

-  Semester-long projects, teams.
-  Develop proposal in first few weeks.
-  May range from novel research to investigation of an established area of complex systems.
-  Two talks + written piece.
-  Usage of the VACC  is encouraged (ability to code well = super powers).
-  Massive data sets available, including Twitter.





Projects

-  Semester-long projects, teams.
-  Develop proposal in first few weeks.
-  May range from novel research to investigation of an established area of complex systems.
-  Two talks + written piece.
-  Usage of the VACC  is encouraged (ability to code well = super powers).
-  Massive data sets available, including Twitter.
-  Possible: Work with Twitter data and Story Lab on socially meaningful problems.





Projects

- Semester-long projects, teams.
- Develop proposal in first few weeks.
- May range from novel research to investigation of an established area of complex systems.
- Two talks + written piece.
- Usage of the VACC  is encouraged (ability to code well = super powers).
- Massive data sets available, including Twitter.
- Possible: Work with Twitter data and Story Lab on socially meaningful problems.
- Academic output (journal papers) resulting from Principles of Complex Systems and Complex Networks can be found here . Add more!












Projects

- Semester-long projects, teams.
- Develop proposal in first few weeks.
- May range from novel research to investigation of an established area of complex systems.
- Two talks + written piece.
- Usage of [the VACC](#)  is encouraged (ability to code well = super powers).
- Massive data sets available, including Twitter.
- Possible: Work with Twitter data and Story Lab on socially meaningful problems.
- Academic output (journal papers) resulting from Principles of Complex Systems and Complex Networks can be found [here](#) . Add more!
- We'll go through a list of possible projects soon.



The narrative hierarchy—Stories and Storytelling on all Scales: ↗



-  1 to 3 word encapsulation = a soundbite = a buzzframe,
-  1 sentence, title,
-  few sentences, a haiku,
-  a paragraph, abstract,
-  short paper, essay,
-  long paper,
-  chapter,
-  book,
-  ...

Orientation

Course Information
Centers, Books, Resources

Topics
Narrative Arc

Tarot Cards
Projects

References



The Boggoracle Speaks:

PoCS, Vol. 1
What's the John
Dory?
54 of 59

Orientation

Course Information

Centers, Books, Resources

Topics

Narrative Arc


Tarot Cards

Projects

References




References I

- [1] P. W. Anderson.
More is different.
Science, 177(4047):393–396, 1972. [pdf](#) 
- [2] P. Ball.
Critical Mass: How One Thing Leads to Another.
Farra, Straus, and Giroux, New York, 2004.
- [3] G. I. Barenblatt.
Scaling, self-similarity, and intermediate asymptotics, volume 14 of Cambridge Texts in Applied Mathematics.
Cambridge University Press, 1996.
- [4] N. Boccaro.
Modeling Complex Systems.
Springer-Verlag, New York, 2nd edition, 2004.




References II

- [5] B. Boyd.
On the Origin of Stories: Evolution, Cognition, and Fiction.
Belknap Press, 2010.
- [6] J. Gleick.
The Information: A History, A Theory, A Flood.
Pantheon, 2011.
- [7] J. Gottschall.
The Storytelling Animal: How Stories Make Us Human.
Mariner Books, 2013.
- [8] M. Granovetter.
Threshold models of collective behavior.
Am. J. Sociol., 83(6):1420–1443, 1978. pdf 




References III

- [9] N. F. Johnson.
Simply Complexity: A Clear Guide to Complexity Theory.
Oneworld Publications, London, UK, 2009. pdf 
- [10] J. E. Mayfield.
The Engine of Complexity: Evolution as Computation.
Columbia University Press, New York, 2013.
- [11] J. H. Miller and S. E. Page.
Complex Adaptive Systems: An introduction to computational models of social life.
Princeton University Press, Princeton, NJ, 2007.



References IV

[12] M. Mitchell.
Complexity: A Guided Tour.
Oxford University Press, New York, NY, 2009.
[pdf](#) 

[13] T. C. Schelling.
Dynamic models of segregation.
J. Math. Sociol., 1:143–186, 1971. [pdf](#) 

[14] T. C. Schelling.
Micromotives and Macrobehavior.
Norton, New York, 1978.

[15] D. Sornette.
Critical Phenomena in Natural Sciences.
Springer-Verlag, Berlin, 2nd edition, 2003.



References V

- [16] M. M. Waldrop.
Complexity: The Emerging Science at the Edge of
Order and Chaos.
Simon & Schuster, New York, NY, 1993.
- [17] F. L. Zhi and L. S. Xian.
Creation of the Universe.
World Scientific Publishing Company, 1989.
- [18] G. K. Zipf.
Human Behaviour and the Principle of
Least-Effort.
Addison-Wesley, Cambridge, MA, 1949.

